

Specification:

[0018] The structure 114 includes a reference component 116 and a monitoring area 118. The reference component 116 includes at least one current injection port 120 for applying a power source and at least one pair of contact points 122, 124 for measuring a potential drop of the reference component 116. The monitoring area 118 will also include at least one pair of contact points 126, 128. The structure 114 will also include [an] a current injection port 130, which when in conjunction with current injection port 120 will allow electrical current to flow through the structure 114.

[0019] Optionally, the structure 114 may include at least one additional reference component 140 including at least one current injection port 132 and at least one pair of contact points 142, 144. Current injection port 132 may be used in conjunction with a current injection port 134 for injecting current in multiple paths.

[0022] Referring to FIG. 2, a block diagram of the monitoring apparatus 112 is illustrated. The monitoring apparatus 112 includes a power supply 202, e.g., a direct current (DC) battery, for supplying an electrical current to the structure 114. The leads 136, 138 are coupled from the power supply 202 to the current injection ports 120, 130 via current switching mechanism 204; e.g., a mercury displacement relay, power semiconductor device such as a power MOSFET or IGBT, or a double-pole, double-throw (DPDT) latching relay. The current switching mechanism 204 has two [states, in] states. In a first state, a positive potential is applied to current injection port 120 and a negative potential is applied to current injection port 130 enabling current to flow from current injection port 120 to current injection port 130. In a second state, the current switching mechanism 204 creates an open circuit between the power supply 202 and the injections ports 120, 130 enabling an off-state reading, e.g., no current flow. The current switching mechanism 204 will be controlled by a first microcontroller 203, or processor, which will determine the state of the current switching mechanism 204 and initiate readings of potential drops as will be described below.